

Experiments and Notes
ABOUT THE
MECHANICAL ORIGINE
OR
PRODUCTION
OF
Electricity.

By the Honourable
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Fellow of the *R. Society.*

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THE UNITED STATES OF AMERICA
AND THE

WORLD OF THE FUTURE

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THat 'tis not necessary to believe Electrical Attraction (which you know is generally listed among Occult Qualities) to be the effect of a naked and solitary Quality flowing immediately from a Substantial Form ; but that it may rather be the effect of a Material Effluvium, issuing from, and returning to, the Electrical Body (and

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perhaps in some cases assisted in its Operation by the external air) seems agreeable to divers things that may be observ'd in such Bodies and their manner of acting.

There are differing *Hypotheses* (and all of them Mechanical, propos'd by the Moderns) to solve the Phenomena of Electrical Attraction. Of these Opinions the First is that of the learned Jesuite *Cabeus*, who, though a Peripatetick and Commentator on *Aristotle*, thinks the drawing of light Bodies by Jet, Amber, &c. may be accounted for, by supposing, that the steams that issue, or, if I may so speak, sally, out of Amber, when heated by rubbing, discuss and expell the neighbouring air; which after it has been driven off a little way, makes as it were a small whirlwind, because of the resistance it finds from the remoter air, which has not been wrought on by the Electrical Steams; and that these, shrinking back swiftly enough to the Amber, do in their returns bring along

long with them such light bodies as they meet with in their way. On occasion of which *Hypothesis* I shall offer it to be consider'd ; Whether by the gravity of the Atmospherical Air , surmounting the Specifick Gravity of the little and rarifi'd Atmosphere, made about the Amber by its emissions, and comprising the light Body fasten'd on by them ; the Attraction may not in divers cases be either caused or promoted.

Another *Hypothesis* is that proposed by that Ingenious Gentleman Sir *Kenelm Digby*, and embraced by the very Learned *Dr. Browne*, (who seems to make our *Gilbert* himself to have been of it) and divers other sagacious men. And according to this *Hypothesis*, the Amber, or other Electrick , being chaf'd or heated, is made to emit certain *Rayes* or *Files* of unctuous Steams , which, when they come to be a little cool'd by the external air , are somewhat condens'd , and having lost of their former agitation, shrink back to the

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body whence they sallied out, and carry with them those light bodies, that their further ends happen to adhere to, at the time of their Retraction: As when a drop of Oyl or Syrup hangs from the end of a small stick, if that be dextrously and cautiously struck, the viscous substance will, by that impulse, be stretch'd out, and presently retreating, will bring along with it the dust or other light bodies that chanced to stick to the remoter parts of it.

And this way of explaining Electrical Attractions is employ'd also by the Learned *Gassendus*, who addes to it, that these Electrical Rays (if they may be so call'd) being emitted several ways, and consequently crossing one another, get into the pores of the Straw, or other light body to be attracted, and by means of their Decussation take the faster hold of it, and have the greater force to carry it along with them, when they shrink back to the Amber

ber whence they were emitted.

A third *Hypothesis* there is, which was devised by the Acute *Cartesius*, who dislikes the Explications of others, chiefly because he thinks them not applicable to Glass, which he supposes unfit to send forth *Effluvia*, and which is yet an Electrical body; and therefore attempts to account for Electrical Attractions by the intervention of certain particles, shap'd almost like small pieces of Ribbond, which he supposes to be form'd of this subtile matter harbour'd in the pores or crevices of Glass. But this *Hypothesis*, though ingenious in it self, yet depending upon the knowledge of divers of his peculiar Principles, I cannot intelligibly propose it in few words, and therefore shall refer you to himself for an account of it: which

*Princip. part 4.
Art. 184.*

I the less scruple to do, because though it be not unworthy of the wonted Acuteness of the Authour, yet he seems himself to doubt, whe-

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ther it will reach all Electrical Bodies; and it seems to me, that the reason why he rejects the way of explicating Attraction by the Emission of the finer parts of the attractant (to which *Hypothesis*, if it be rightly proposed, I confess myself very inclinable) is grounded upon a mistake, which, though a Philosopher may, for want of Experience in that Particular, without disparagement fall into, is nevertheless a mistake. For whereas our excellent Author says, that *Electrical Effluvia*, such as are supposed to be emitted by Amber, Wax, &c. cannot be imagin'd to proceed from Glass, I grant the Supposition to be plausible, but cannot allow it to be true. For as solid a body as Glass is, yet if you but dextrously rub for two or three minutes a couple of pieces of Glass against one another, you will find that Glass is not onely capable of emitting *Effluvia*, but such ones as to be odorous, and sometimes to be rankly stinking.

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But it is not necessary, that in this Paper, where I pretend not to write Discourses but Notes, I should consider all that has been, or I think may be, said for and against each of the above-mentioned *Hypotheses*; since they all agree in what is sufficient for my present purpose, namely, that Electrical Attractions are not the Effects of a meer Quality, but of a Substantial Emanation from the attracting Body: And 'tis plain, that they all endeavour to solve the *Phænomena* in a Mechanical way, without recurring to Substantial Forms, and inexplicable Qualities, or so much as taking notice of the Hypostatical Principles of the Chymists. Wherefore it may suffice in this place, that I mention some *Phænomena* that in general make it probable, that Amber, &c. draws such light Bodies, as pieces of Straw, Hair, and the like, by vertue of some Mechanical Affections either of the attracting or of the attracted Bodies, or of both the one and the other.

I. The

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1. The first and most general Observation is, That Electrical Bodies draw not unless they be warm'd; which Rule though I have now and then found to admit of an Exception, (whereof I elsewhere offer an account,) yet, as to the generality of common Electricks, it holds well enough to give much countenance to our Doctrine, which teaches the effects of Electrical Bodies to be perform'd by Corporeal Emanations. For 'tis known, that Heat, by agitating the parts of a fit Body, solicites it as it were to send forth its *Effluvia*, as is obvious in odoriferous Gums and Perfumes, which, being heated, send forth their fragrant Steams, both further and more copiously than otherwise they would.

2. Next, it has been observ'd, that Amber, &c. warm'd by the fire, does not attract so vigorously, as if it acquire an equal degree of heat by being chaf'd or rub'd: So that the modification of motion in the internal parts, and in the Emanations of
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the Amber, may, as well as the degree of it, contribute to the Attraction. And my particular Observations incline me to adde, that the effect may oftentimes be much promoted, by employing both these ways successively; as I thought I manifestly found when I first warm'd the Amber at the fire, and presently after chaf'd it a little upon a piece of cloth. For then a very few rubbings seem'd to excite it more than many more would otherwise have done: As if the heat of the fire had put the parts into a general, but confus'd, agitation; to which 'twas easie for the subsequent Attrition (or Reciprocation of Pressure) to give a convenient modification in a Body whose Texture disposes it to become vigorously Electrical.

3. Another Observation that is made about these Bodies, is, That they require Tersion as well as Attrition; and though I doubt whether the Rule be infallible, yet I deny not but that weaker Electricks require

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quire to be as well wip'd as chaf'd; and even good ones will have their Operation promoted by the same means. And this is very agreeable to our Doctrine, since Tersion, besides that it is, as I have sometimes manifestly known it, a kind or degree of Attrition, frees the Surface from those adherences that might choak the pores of the Amber, or at least hinder the emanation of the Steams to be so free and copious as otherwise it would be.

4. 'Tis likewise observ'd, That whereas the Magnetical Steams are so subtile, that they penetrate and perform their Operation through all kind of Mediums hitherto known to us; Electrical Steams are like those of some odoriferous Bodies, easily check'd in their progress, since 'tis affirm'd by Learned Writers, who say they speak upon particular Trial; that the interposition of the finest Linnen or Sarinet is sufficient to hinder all the Operation of excited Amber upon a Straw or Feather plac'd

plac'd never so little beyond it.

5. It has been also observed, that the effects of Electrical Attraction are weaken'd if the air be thick and cloudy; and especially if the South-wind blows: And that Electricks display their vertue more faintly by night than by day, and more vigorously in clear weather, and when the winds are Northerly. All which the Learned *Kircherus* asserts himself to have found true by experience; insomuch that those bodies that are but faintly drawn when the weather is clear, will not, when 'tis thick and cloudy, be at all moved.

6. We have also observed, That divers Concretes, that are notably Electrical, do abound in an effluvi-able matter (if I may so call it) which is capable of being manifestly evaporated by heat and rubbing. Thus we see, that most Resinous Gums, that draw light bodies, do also, being moderately solicited by heat, (whether this be excited by the fire, or by Attrition or Contusi-
on)

on) emit steams. And in pieces of *Sulphur* conveniently shaped, I found upon due Attrition a Sulphureous stink. And that piece of Amber which I most employ, being somewhat large and very well polish'd, will, being rub'd upon a piece of woollen cloth, emit steams, which the nostrils themselves may perceive; and they sometimes seem to me not unlike those that I took notice of, when I kept in my mouth a drop or two of the diluted Tincture (or Solution of the finer parts) of Amber made with Spirit of Wine, or of Sal Armoniac.

7. It agrees very well with what has been said of the corporeal Emanations of Amber, that its attractive power will continue some time after it has been once excited. For the Attrition having caus'd an intestine commotion in the parts of the Concrete, the heat or warmth that is thereby excited ought not to cease, as soon as ever the rubbing is over, but to continue capable of emitting

Effluvia

Effluvia for some time afterwards, which will be longer or shorter according to the goodness of the Electric, and the degree of the Antecedent commotion: which joyn'd together may sometimes make the effect considerable, insomuch that in a warm day, about noon, I did with a certain body, not much, if at all, bigger than a Pea, but very vigorously attractive, move to and fro a Steel Needle freely poysed, about three minutes (or the twentieth part of an hour) after I had left off rubbing the Attraction.

8. That it may not seem impossible, that Electrical *Effluvia* should be able to insinuate themselves into the pores of many other bodies, I shall adde, that I found them subtile enough to attract not onely Spirit of Wine, but that fluid aggregate of Corpuscles we call Smoak. For having well lighted a Wax-taper, which I prefer'd to a common Candle to avoid the stink of the snuff, I blew out the flame; and, when the smoak ascend-

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ascended in a slender stream, held, at a convenient distance from it, an excited piece of Amber or a chafed Diamond, which would manifestly make the ascending smoak deviate from its former line, and turn aside, to beat, as it were, against the Electric, which, if it were vigorous, would act at a considerable distance, and seemed to smoak for a pretty while together.

9. That 'tis not in any peculiar Sympathy between an Electric and a body whereon it operates, that Electrical Attraction depends, seems the more probable, because Amber, for instance, does not attract onely one determinate sort of bodies, as the Loadstone does Iron, and those bodies wherein it abounds; but as far as I have yet tried, it draws indifferently all bodies whatsoever, being plac'd within a due distance from it, (as my choicest piece of Amber draws not onely Sand and Mineral Powders, but Filings of Steel and Copper, and beaten Gold it self)

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provided they be minute or light enough, except perhaps it be fire: I employ the word *perhaps*, because I am not yet so clear in this point. For having applied a strong Electric at a convenient distance to small fragments of ignited matter, they were readily enough attracted, and shin'd, whilst they were sticking to the body that had drawn them: But when I look'd attentively upon them, I found the shining sparks to be, as it were, cloath'd with light ashes, which, in spite of my diligence, had been already form'd about the attracted Corpuscles, upon the expiring of a good part of the fire; so that it remain'd somewhat doubtful to me, whether the ignited Corpuscles, whilst they were totally such, were attracted; or whether the immediate objects of the Attraction were not the new form'd ashes, which carried up with them those yet unextinguished parts of fire, that chanc'd to be lodg'd in them. But, as for flame, our Countreyman

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Gilbert delivers as his Experiment, That an Electric, though duly excited and applied, will not move the flame of the slenderest Candle. Which some will think not so easie to be well tried with common Electricks, as Amber, hard Wax, Sulphur, and the like unctuous Concretes, that very easily take fire: Therefore I chose to make my Trial with a rough Diamond extraordinarily attractive, which I could, without injuring it, hold as near as I pleas'd to the flame of a Candle or Taper; and though I was not satisfi'd that it did either attract the flame, as it visibly did the smoak, or manifestly agitate it; yet granting that *Gilbert's* Assertion will constantly hold true, and so, that flame is to be excepted from the general Rule, yet this exception may well comport with the *Hypothesis* hitherto countenanc'd, since it may be said, as 'tis, if I mistake not, by *Kirkerus*, that the heat of the flame dissipates the *Effluvia*, by whose means the Attracti-

traction should be perform'd. To which I shall adde, that possibly the Celerity of the motion of the Flame upwards, may render it very difficult for the Electrical Emanations to divert the Flame from its Course.

10. We have found by Experiment, That a vigorous and well excited piece of Amber will draw, not onely the powder of Amber, but less minute fragments of it. And as in many cases one contrary directs to another, so this Trial suggested a further, which, in case of good success, would probably argue, that in Electrical Attraction not onely *Effluvia* are emitted by the Electrical body, but these *Effluvia* fasten upon the body to be drawn, and that in such a way, that the intervening viscous strings, which may be supposed to be made up of those cohering *Effluvia*, are, when their agitation ceases, contracted or made to shrink inwards towards both ends, almost as a highly stretch'd Lute-string does when 'tis permitted to retreat into

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shorter Dimensions. But the Conjecture it self was much more easie to be made than the Experiment requisite to examine it. For we found it no easie matter to suspend an Electric, great and vigorous enough, in such a manner, that it might, whilst suspended, be excited, and be so nicely poised, that so faint a force as that wherewith it attracts light bodies should be able to procure a Local Motion to the whole Body it self. But after some fruitless attempts with other Electricks, I had recourse to the very vigorous piece of polish'd Amber, formerly mention'd, and when we had with the help of a little Wax suspended it by a silken thread, we chafed very well one of the blunt edges of it upon a kind of large Pin-cushion cover'd with a coarse and black woollen stuff, and then brought the Electric, as soon as we could, to settle notwithstanding its hanging freely at the bottom of the string. This course of rubbing on the edge of the Amber we pitch'd
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upon for more than one reason; for if we had chafed the flat side, the Amber could not have approached the body it had been rub'd on without making a change of place in the whole Electric, and, which is worse, without making it move (contrary to the nature of heavy bodies) somewhat upwards; whereas the Amber having, by reason of its suspension, its parts counterpoised by one another; to make the excited edge approach to another body, that edge needed not at all ascend, but only be moved horizontally, to which way of moving the gravity of the Electric (which the string kept from moving downwards) could be but little or no hinderance. And agreeably to this we found, that if, as soon as the suspended and well rubb'd Electric was brought to settle freely, we applied to the chafed edge, but without touching it, the lately mention'd Cushion, which, by reason of its rough *Superficies* and porosity, was fit for the Electrical

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Effluvia to fasten upon, the edge would manifestly be drawn aside by the Cushion steadily held, and if this were slowly removed, would follow it a good way; and when this body no longer detain'd it, would return to the posture wherein it had settled before. And this power of approaching the Cushion by vertue of the operation of its own streams, was so durable in our vigorous piece of Amber, that by once chasing it, I was able to make it follow the Cushion no less than ten or eleven times. Whether from such Experiments one may argue, that 'tis but, as 'twere, by accident that Amber attracts another body, and not this the Amber; and whether these ought to make us question, if Electricks may with so much propriety, as has been hitherto generally supposed, be said to *Attract*, are doubts that my Design does not here oblige me to examine.

Some other *Phænomena* might be added of the same Tendency with those

those already mention'd, (as the advantage that Electrical Bodies usually get by having well polish'd or at least smooth Surfaces,) but the Title of this Paper promising some *Experiments* about the *Production* of Electricity, I must not omit to recite, how I have been sometimes able to produce or destroy this Quality in certain bodies, by means of alterations, that appear'd not to be other than Mechanical.

EXPER. I.

AND first, having with a very mild heat slowly evaporated about a fourth part of good Turpentine, I found, that the remaining body would not, when cold, continue a Liquor, but harden'd into a transparent Gum almost like Amber, which, as I look'd for, proved Electrical.

EXPER. II.

SEcondly, by mixing two such liquid Bodies as *Petroleum* and strong Spirit of Nitre in a certain proportion, and then distilling them till there remained a dry mass, I obtain'd a brittle substance as black as Jet; and whose Superficies (where it was contiguous to the Retort) was glossie like that Mineral when polished; and as I expected I found it also to resemble Jet, in being endowed with an Electrical Faculty.

EXPER. III.

THirdly, Having burnt Antimony to ashes, and of those ashes, without any addition, made a transparent Glass, I found, that, when rubb'd, as Electrical Bodies ought to be to excite them, it answer'd my expectation, by manifesting a not inconsiderable Electricity. And this is the worthier of notice, because, that *as a Vitrum*

Vitrum Antimonii, that is said to be purer than ordinary, may be made of the *Regulus* of the same Mineral, in whose preparation you know a great part of the Antimonial Sulphur is separated and left among the *Scoria*; so Glass of Antimony made without additament, may easily, as experience has inform'd us, be in part reduc'd to a *Regulus*, (a Body not reckon'd amongst Electrical ones.) And that you may not think, that 'tis onely some peculiar and fixt part of the Antimony that is capable of *Vitrification*, let me assure you, that even with the other part that is wont to flye away, (namely the Flowers) an Antimonial Glass may without an addition of other Ingredients be made.

EXPER. IV.

FOurthly, The mention of a Vitrified Body brings into my mind, that I more than once made some Glass of Lead *per se*, (which
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I found no very easie work) that also was not wholly destitute of an Electrical Vertue, though it had but a very languid one. And it is not here to be overlook'd, that this Glass might easily be brought to afford again malleable Lead, which was never reckon'd, that I know of, among Electrical Bodies.

EXPER. V.

Fifthly, Having taken some Amber, and warily distill'd it, not with Sand or powder'd Brick, or some such additament as Chymists are wont to use, for fear it should boyl over or break their Vessels; but by its self, that I might have an un-mixed *Caput mortuum*; Having made this Distillation, I say, and continued it till it had afforded a good proportion of phlegm, Spirit, Volatile Salt, and Oyl, the Retort was warily broken, and the remaining matter was taken out in a lump, which, though it had quite lost its colour being burnt

burnt quite black, and though it were grown strangely brittle in comparison of Amber, so that they who believe the vertue of attracting light Bodies to flow from the substantial form of Amber, would not expect it in a Body so changed and deprived of its noblest parts: Yet this *Caput mortuum* was so far from having lost its Electrical Faculty, that it seemed to attract more vigorously than Amber it self is wont to do before it be committed to Distillation.

And from the foregoing Instances afforded us by the Glass of Antimony, we may learn, that when the form of a Body seems to be destroyed by a fiery *Analysis* that dissipates the parts of it, the remaining substance may yet be endowed with Electricity, as the *Caput mortuum* of Amber may acquire it; as in the case of the Glass of Antimony made of the *Calx* and of the Flowers. And from the second Example above-mentioned, and from common Glass which is Electrical, we may also learn,

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learn, that Bodies that are neither of them apart observed to be endowed with Electricity, may have that Virtue result in the compounded substance that they constitute, though it be but a factitious Body.

To the foregoing Experiments, whose Success is wont to be uniform enough, I shall adde the Recital of a surprising *Phænomenon*, which, though not constant, may help to make it probable, that Electrical Attractions need not be suppos'd still to proceed from the substantial, or even from the essential Form of the Attrahent; but may be the effects of unheeded, and, as it were, fortuitous Causes. And however, I dare not suppress so strange an Observation, and therefore shall relate that which I had the luck to make of an odd sort of Electrical Attraction (as it seem'd,) not taken notice of (that I know of) by any either Naturalist or other Writer, and it is this.

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EXPER. VI.

That false Locks (as they call them) of some Hair , being by curling or otherwise brought to a certain degree of driness, or of stiffness , will be attracted by the flesh of some persons , or seem to apply themselves to it , as Hair is wont to do to Amber or Jet excited by rubbing. Of this I had a Proof in such Locks worn by two very Fair Ladies that you know. For at some times I observed , that they could not keep their Locks from flying to their Cheeks , and (though neither of them made any use , or had any need of Painting) from sticking there. When one of these Beauties first shew'd me this Experiment, I turn'd it into a Complementary Raillery , as suspecting there might be some trick in it, though I after saw the same thing happen to the others Locks too. But as she is no ordinary *Virtuosa*, she very

ry ingeniously remov'd my suspicions, and (as I requested) gave me leave to satisfy my self further, by desiring her to hold her warm hand at a convenient distance from one of those Locks taken off and held in the air. For as soon as she did this, the lower end of the Lock, which was free, applied it self presently to her hand: which seem'd the more strange, because so great a multitude of Hair would not have been easily attracted by an ordinary Electrical Body, that had not been considerably large, or extraordinarily vigorous. This repeated Observation put me upon inquiring among some other young Ladies, whether they had observed any such like thing, but I found little satisfaction to my Question, except from one of them eminent for being ingenious, who told me, that sometimes she had met with these troublesome Locks; but that all she could tell me of the Circumstances, which I would have been inform'd about, was, that they seem'd to her

to flye most to her Checks when they had been put into a somewhat stiff Curle, and when the Weather was frosty *.

* Some years after the making the Experiments about the Production of *Electricity*, having a desire to try, whether in the Attractions made by Amber, the motions excited by the air had a considerable Interest, or whether the Effect were not due rather to the Emission and Retraction of Effluvia, which being of a viscous nature may consist of Particles either branch'd or hookt, or otherwise fit for some kind of Cohesion, and capable of being stretch'd, and of shrinking again, as Leather Thongs are : To examine this, I say, I thought the fittest way, if 'twere practicable, would be, to try, whether Amber would draw a light Body in a Glass whence the air was pumpt out. And *though* the Trial of this seem'd very difficult to make, and we were somewhat discouraged by our first attempt, wherein the weight of the ambient air broke our Receiver, which chanced to prove too weak, when the internal air had been with extraordinary diligence pumpt out; yet having a vigorous piece of Amber, which I had caus'd to be purposely turn'd and polish'd
for

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for Electrical Experiments, I afterwards
repeated the Trial, and found, that in
warm Weather it would retain a manifest
power of attracting for several minutes
(for it stirred a pois'd Needle after above
 $\frac{1}{4}$ of an hour) after we had done rubbing
it. Upon which encouragement we sus-
pended it, being first well chafed, in a
Glas Receiver that was not great, just over
a light Body; and making haste with our
Air-Pump to exhaust the Glas, when the
Air was withdrawn, we did by a Contri-
vance let down the suspended Amber till it
came very near the Straw or Feather, and
perceived, as we expected, that in some
Trials, upon the least Contact it would lift
it up; and in others, for we repeated the
Experiment, the Amber would raise it
without touching it, that is, would attract
it.

You will probably be the less
dispos'd to believe, That Electrical
Attractions must proceed from the
Substantial Forms of the Attrahents,
or from the Predominancy of this or
that Chymical Principle in them, if I
acquaint you with some odd Trials
wherein the Attraction of light Bo-
dies

dies seem'd to depend upon very small circumstances. And though forbearing at present, to offer you my thoughts about the cause of these surprising *Phænomena*, I propose it onely as a Probleme to your self and your curious Friends, yet the main circumstances seeming to be of a Mechanical Nature, the recital of my Trials will not be impertinent to the Design and Subject of this Paper.

EXPER. VII.

I Took then a large and vigorous piece of Amber conveniently shaped for my purpose, and a downy feather, such as grows upon the Bodies, not Wings or Tails of a somewhat large Chicken: Then having moderately excited the Electrick, I held the Amber so near it, that the neighbouring part of the feather was drawn by it and stuck fast to it; but the remoter parts continued in their former posture. This done, I applied my fore-finger to these erected
C downy

downy feathers, and immediately, as I expected, they left their preceeding posture, and applied themselves to it as if it had been an Electrical Body. And whether I offered to them my nail, or the pulpy part of my finger, or held my finger towards the right hand or the left, or directly over, these downy feathers that were near the little Quill did nimbly, and, for ought appear'd, equally turn themselves towards it, and fasten themselves to it. And to shew that the steams that issued out of so warm a Body as my finger were not necessary to attract (as men speak) the abovementioned feathers, instead of my finger, I applied to them, after the same manner, a little Cylindrical Instrument of Silver, to which they bowed and fastened themselves as they had done to my finger, though the tip of this Instrument were presented to them in several postures. The like success I had with the end of an Iron Key, and the like also with a cold piece of polish'd black Marble; and sometimes the

the feathers did so readily and strongly fasten themselves to these extraneous and unexcited Bodies, that I have been able (though not easily) to make one of them draw the feather from the Amber it self.

But it is diligently to be observ'd, that this unusual attraction happened onely whilst the electrical operation of the excited Amber continued strong enough to sustain the feathers. For afterwards, neither the approach of my finger, nor that of the other bodies, would make the downy feathers change their posture. Yet as soon as ever the Amber was by a light affriction excited again, the feather would be disposed to apply it self again to the abovementioned Bodies.

And lest there should be any peculiarity in that particular feather, I made the Trials with others (provided they were not long enough to exceed the sphere of activity of the Amber) and found the Experiment to answer my expectation.

I made the Experiment also at differing times, and with some months, if not rather years, of interval, but with the like success.

And lest you should think these *Phænomena* proceed from some peculiarity in the piece of Amber I employed, I shall add, that I found uniformity enough in the success, when, in the place of Amber, I substituted another Electrick, and particularly a smooth mass of melted Brimstone.

These are the *Phænomena* I thought fit to mention at present of this unusual way of drawing light bodies, and with this Experiment I should conclude my Notes about Electricity, but that I think it will not be amiss before I take leave of this Subject, to give this Advertisement, That the event of Electrical Experiments is not always so certain as that of many others, being sometimes much varied by seemingly slight circumstances, and now and then by some that are altogether over-look'd. This Observation may receive credit from some of
the

the particulars above recited (especially concerning the interest of the weather, &c. in Electrical Phenomena.) But now I shall add, that, not onely there may happen some variations in the success of Trials made with Electrical Bodies, but that it is not so certain as many think, whether some particular Bodies be or be not Electrical. For the inquisitive *Kircherus* reckons Crystill among those Gems to whom Nature has denied the attractive power we are speaking of; and yet I remember not, that, among all the trials I have made with native Crystill, I have found any that was destitute of the power he refuses them. Also a late most learned Writer reciting the Electricks, reckon'd up by our industrious Countryman *Gilbert*, and increasing their number by some observed by himself, (to which I shall now add, besides white Saphyrs, and white English Amethysts, the almost Diaphanous spar of Lead Ore) denies Electricity to a couple of transparent Gems, the Cornelion and the Emerald. And I do the less wonder he should do so to the former, because I have my self in vain tried to make any attraction with a piece of Cornelion so large and fair, that 'twas kept for a rarity; and yet with divers other fine Cornelions I have been able to attract some light bodies very manifestly,

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ly, if not briskly; and I usually wear a Cornelian Ring, that is richly enough endowed with Electricity. But as for Emeralds, as I thought it strange that Nature should have denied them a Quality she has granted to so many other Diaphanous Gems, and even to Crystal, so I thought the assertion deserved an *Examen*, upon which I concluded, that at least it does not universally and constantly hold true. I had indeed seen in a Ring a Stone of price and great lustre, which, though green, I found to be, (as I guess'd it would prove) vigorously enough Electrical. But this Experiment, though seemingly conclusive, I did not look upon as a fair trial, because the Stone was not a true Emerald, but, which is rare, a green Saphir. And I learned by inquiry of the skillful Jeweller that cut it, that it was so far from having the softness of an Emerald, that he found it harder than blew Saphyrs themselves, which yet are Gems of great hardness, and by some reputed second to none, but Diamonds. Without therefore concluding any thing from this Experiment, save that, if the assertion I was to examine were true, the want of an Electrical faculty might be thought a Concomitant rather of the peculiar Texture of the Emerald than of its green colour, I proceeded

to make trial with three or four Emralds, whose being true was not doubted, and found them all somewhat, though not equally, endow'd with Electricity, which I found to be yet more considerable in an Emrald of my own, whose colour was so excellent, that by skilful persons 'twas look'd on as a rarity. And though, by this success of my inquiry, I perceived I could not, as else I might have done, shew the Curious a new way of judging of true and false Emralds, yet the like way may be, though not always certain, yet oftentimes of use, in the estimating whether Diamonds be true or counterfeit, especially, if, being set in Rings, the surest way of trying them cannot conveniently be employed. For whereas Glass, though it have some Electricity, seems, as far as I have observed, to have but a faint one, there are often found Diamonds that have a very vigorous one. And I do not remember I met with any Electrick of the same bulk, that was more vigorous than a rough Diamond I have, which is the same that I formerly mentioned to have moved a Needle above three minutes after I had ceased to chafe it. And this brings into my mind, that it has been observed, that Diamonds draw better whilst rough, than they do after they are cut and polish'd,

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polish'd; which seeming to contradict what has been observed by others and by us also, that Amber, for instance, attracts more vigorously if the surface be made very smooth than otherwise, it induces me to conjecture, that, if this Observation about Diamonds be true, as some of my trials have now and then inclined me to think it, and if it do not in some cases considerably depend upon the loss of the (Electrical) Substance of the Stone, by its being cut and ground, the Reason may possibly be, that the great rapidness with which the Wheels that serve to cut and polish Diamonds must be mov'd, does excite a great degree of heat, (which the senses may easily discover) in the Stone, and by that and the strong concussion it makes of its parts, may force it to spend its effluvia matter, if I may so call it, so plentifully, that the Stone may be impoverish'd, and perhaps also, on the account of some little change in its Texture, be rendred lesse disposed to emit those *effluvia* that are Instruments of Electrical Attraction. But as I willingly leave the matter of Fact to further Trial, so I do the Cause of it, in case it prove true, to farther Inquiry.

FINIS.

